ENERGY ASSURANCE TECHNOLOGIES

Project Fact Sheet

Visualization and Simulation Tool for Characterizing Critical and Vulnerable Nodes in Multiple Energy Infrastructure Sectors

Benefits

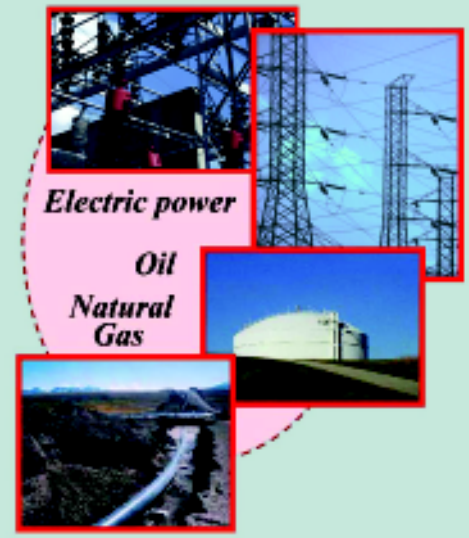
- Provide users the ability to identify an electrical network's critical assets and components
- Predict the response of the system to events
- Maps electrical components affected by outages, and visualize outage areas and affected systems.

Application

The new technology, a modeling and simulation (M&S) tool, will give end users the ability to identify an electrical network's critical nodes, predict the response of the system to events, map electrical components affected by outages, and visualize outage areas and affected systems. Specifically, the new tool will combine the power of the LANL IEISS Solver algorithms with the visualization and spatial intelligence of the General Electric (GE) Smallworld toolkit application to help plan recovery from loss of critical components.

Disruption of the nation's energy system would directly and adversely impact the economic security of our nation.

Since the middle of the 1970s, researchers have studied energy generation and transmission networks, such as electric power grids to assist federal, state, and local agencies to understand these infrastructures, to track their evolution, to identify their strengths and weaknesses, to assess their reliability, and to analyze their economics. Much of the analysis of the electric power industry worked to identify outage events that may impact the reliable supply of electric power and the development of vulnerability mitigation options and business continuity strategies for federal decision-makers. Inherent attributes of the electricity supply system, natural causes, or man-made causes each constitute possible sources of disturbances in the power system. Detailed transmission-level utility models and teams of engineers analyzed the models using state-of-the-art power flow simulation tools to identify (i) service and outage areas, (ii) outage duration, (iii) critical system components, (iv) restoration strategies, (v) mitigation options, and (vi) system performance. The goal is to determine the electric grid's ability to supply the aggregate electrical demand and energy requirements of its customers, taking into account outages of system elements. Recently LANL has also investigated the impact of regional deregulation on system reliability: differences in state and federal guidelines or policies, differences among state deregulation policies within the same geographic region, planned new regional transmission organizations and new independent system operators create a complex new environment for the electric power industry. We envision a diversity of possible applications for analyses based on IEISS: Primarily, one can accurately identify critical components and vulnerabilities in coupled infrastructure systems, assess how future investments in the systems might affect quality of service, perform integrated cost-benefit studies, evaluate the effect of regulatory policies, and aid in decision-making during crises.



An outage in one energy system can cause failures in other systems. The new technology will give end users the ability to identify a network's critical assets and components and predict the response of the system to events.

Project Description:

This project combines the leadership and technical experience of two national laboratories, Los Alamos National Laboratory (LANL) and Idaho National Engineering and Environmental Laboratory (INEEL), with the industry leadership of General Electric (GE) in developing capability to help assure the long-term reliability and stability of the energy infrastructure. This new technology, a modeling and simulation tool, will enable end users to identify a network's critical nodes, predict the response of the system to events, map electrical components affected by outages, and visualize outage areas and infrastructure interdependencies systems. This tool will combine the power of the LANL IEISS Solver algorithms with the visualization and spatial intelligence of the General Electric Smallworld toolkit application. Development of the new analytical tool will be accomplished by combining the analytical power of the LANL IEISS Solver algorithms and the usability, and market acceptability of the General Electric (GE) Smallworld Spatial Technology application. The program will be completed and demonstrated at Ameren UE facilities in St Louis with Ameren data.

Progress and Milestones

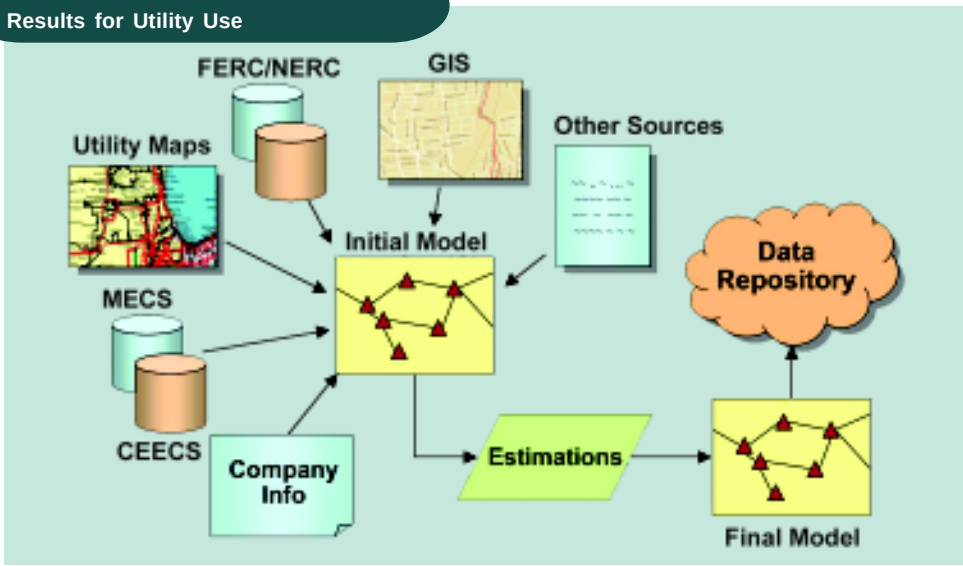
This project includes the following milestones:

- Complete design, construction and preliminary testing of the prototype model (3Q/04)
- Complete application and validation experiment at the National SCADA Testbest at the Idaho National Laboratory (4Q/04)
- Complete final demonstration of the model at the St. Louis Headquarters of Ameren UE (4Q/04)

Economic and Commercial Potential:

Upon successful demonstration of the tool, it is anticipated that GE will incorporate the tool into its product line. Potential sales are estimated at several million dollars in the first year.

The Final Model Presents Visualized Results for Utility Use



When a disruption is detected, data inputs from many sources and in a variety of formats can be combined with company information to provide impact estimates for contingency planners and decision makers.

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Project Partners

Los Alamos National Laboratory

Idaho National Laboratory

General Electric Network Reliability Services

Ameren UE – Energy Delivery Technical Services

Interested in joining the partnership, being informed of outcomes, or being a demonstration site? Contact:

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January 2004